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**UNITED STATES PATENT APPLICATION**

**of**

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**for**

**TENSION LOCK FOR EXHIBITION FRAMES**

**TENSION LOCK FOR EXHIBITION FRAMES****CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] This application is a nationalization of PCT Application No. PCT/CN2004/001449, filed December 14, 2004, which claims priority to Chinese Patent Application No. 200410013855.4 filed January 6, 2004, the contents of which are incorporated herein by specific reference.

**BACKGROUND OF THE INVENTION****Field of the invention**

[0002] This invention generally relates to a connecting lock, and more particularly to a lock for connecting exhibition stands.

**Background Art**

[0003] Exhibition stands used, for example, in expositions and other places, for showing and demonstrating products are typically steady frame ones consisting of beams and columns, which are connected and fixed through connecting locks. Prior Chinese Patents **ZL99113438** and **ZL99113439** disclosed connecting locks invented by the applicant. Figure 1 shows the composite structure of the connecting lock. Figures 2 and 3 show the shape and structure of a lock plate 2. Figure 4 shows the shape and structure of a lock shell 1. It can be seen from these figures that the connecting lock comprises lock plate 2, an eccentric lock cam 3 and lock shell 1. lock plate 2 is

inserted into lock shell 1. After lock plate 2 has been inserted into lock shell 1, eccentric lock cam 3 is inserted through the bottom of lock shell 1 into an opening 15 that has an arc 151 (see Figure 4), then through hole 5 on lock plate 2, and finally into hole 53 on lock shell 1. Once fully inserted, eccentric lock cam 3 can be rotated to lock the structure in place.

**[0004]** Figure 2 shows the shape and structure of lock plate 2 of the connecting lock. As depicted, there are two elongated slots 1001 and 1002 on lock plate 2, each slot 1001 and 1002 being divided into three sections 41, 42 and 43 of different widths so that three plate tongues 1010, 1011, and 1012 of different widths are disposed at the front end 1100 of lock plate 2. The front ends of plate tongues 1010, 1011, and 1012 are bent into hooks 21, 22 and 23, respectively, with a reverse bending direction between adjacent hooks. The back end 1102 of lock plate 2 is bent into a U-shaped half-loop 26 having an end surface 261 in the form of a plane.

**[0005]** When eccentric lock cam 3 is rotated, a big cam 361, which is on eccentric lock cam 3 pushes against end surface 261, forcing lock plate 2 to move toward the back end 1106 of lock shell 1. This forces bevels 231, 232 and 233 on plate tongues 1010, 1011, and 1012, respectively, to move backwards along inclined bearing surfaces 131, 121 and 111. Because of this bevel movement, the three hooks 21, 22, and 23 on the front end 1100 of lock plate 2 expand along reverse directions, causing connecting lock fixed in the beam to be locked inside the column section bar. This results in steady and fixed frame exhibition stands. The movement of lock plate 2 is stopped by a small stop cam 362 located on the front end of eccentric lock cam 3 which presses against a side wall of hole trough 5 on lock plate 2.

**[0006]** The connecting lock described above has very good usability and has been applied widely. However, since eccentric lock cam 3 has two cams – big cam 361 and small cam 362, the difficulty of fabrication is increased. Eliminating small stop cam 362 would cause fabrication to be easier. However, it would be necessary to change the stop structure if small stop cam 362 was eliminated, which would cause technical difficulties.

## SUMMARY OF THE INVENTION

[0007] The invention is directed to a new kind of connecting lock aimed at solving the above mentioned technical difficulties, and improving on the conventional connecting lock described in the Background section. Improvements to the lock plate and shape and structure of the eccentric lock cam are disclosed, which simplify the connecting lock structure, reduce cost and facilitate ease of use.

[0008] The technology solution for the invention is: a connecting lock used for exhibition stands, comprising a lock shell 1, a lock plate 2 and an eccentric lock cam 3.

[0009] The lock shell has inclined bearing surfaces 131, 121 and 111 in a front portion 1104 thereon.

[0010] Lock plate 2 has a front end 1100 and a back end 1102, with a plurality of plate tongues 1010, 1011, and 1012 having different widths being disposed at the front end 1100 of lock plate 2. The front end of each plate tongue 1010, 1011, and 1012 are bent into hooks 21, 22, and 23, respectively, with a reverse bending direction between adjacent hooks. Each plate tongue has a beveled surface 231, 211, and 221. The plate tongues are separated by a plurality of elongated slots 1001 and 1002, each slot being divided into three sections 41, 42, and 43 of different widths. The back end 1102 of lock plate 2 is bent into a U-shaped half-loop 26 having an end surface 261 in the form of a plane. A stop tooth 27 is also disposed on lock plate 2.

[0011] Eccentric lock cam 3 comprises a fully arc shaped eccentric cam 332, a big shaft 333, and a small shaft 331. A Quincunx hole 334, which allows easy rotation of eccentric lock cam 3 with a special matching tool, is formed on the surface of big shaft 333.

**[0012]** By adopting the above mentioned improvements, the structure of the Plate tongue and Eccentric lock cam is simplified and the stop structure is changed. As a result, the structure and process of the connecting lock is further simplified, the cost is saved, and the adaptability is increased.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

[0013] Figure 1 is a cross sectional side view showing the composite structure of an existing connecting lock;

[0014] Figure 2 is a side view of the lock plate shown in Figure 1;

[0015] Figure 3 is a top view of the lock plate shown in Figure 2;

[0016] Figure 4 is a bottom view of a lock shell according to one embodiment of the invention;

[0017] Figure 5 is a cross sectional side view of the lock shell shown in Figure 4;

[0018] Figure 6 is a cross sectional side view of a connecting lock according to one embodiment of the invention;

[0019] Figure 7 is a side view of the lock plate shown in Figure 6;

[0020] Figure 8 is a top view of the lock plate shown in Figure 7;

[0021] Figure 9 is a partial cross sectional side view of the eccentric lock cam shown in Figure 6;

[0022] Figure 10 is a left view of the eccentric lock cam shown in Figure 9;

[0023] Figure 11 is a right view of the eccentric lock cam shown in Figure 9;

[0024] Figure 12 is a bottom view of a connecting lock according to another embodiment of the invention; and

[0025] Figure 13 is a cross sectional side view of the connecting lock shown in Figure 12.

[0026] In Figures 1-3 an existing technical connecting lock is shown, where:

2 is the lock plate,

**3** is the eccentric lock cam,

**1** is the lock shell,

**1100** and **1102** are the front end and back end, respectively, of lock plate **2**;

**1104** and **1106** are the front end and back end, respectively, of lock shell **1**;

**15** is the opening with an arc **151** formed on lock shell **1**,

**5** is the hole formed on lock plate **2**,

**53** is the hole formed on bottom side of lock shell **1**,

**1001** and **1002** are slots with different widths **41**, **42** and **43** formed on lock plate **2**,

**1010**, **1011**, and **1012** are plate tongues with different widths disposed on the front end of lock plate **2**,

**21**, **22** and **23** are hooks of plate tongues **1010**, **1011**, and **1012** respectively;

**361** is the big cam on eccentric lock cam **3**;

**362** is the stop cam on the front end of eccentric lock cam **3**;

**26** is a U-shaped half loop on the back end of lock plate **2**;

**24** is the elastic brace rod on lock plate **2**;

**241** and **141** are the contact points of elastic brace rod **24** on the internal surface of lock shell **1**;

**221** and **121** are the parts of the braced structure between the hook bevel on the front end of lock plate **2** and the lock shell **1** bearing plane.



**[0027]** In Figures 4-11:

**1** is the lock shell;

**2** is the lock plate;

**3** is the eccentric lock cam;

**1100** and **1102** are the front end and back end, respectively, of lock plate **2**;

**1104** and **1106** are the front end and back end, respectively, of lock shell **1**;

**1010**, **1011**, and **1012** are plate tongues with different widths disposed on the front end of lock plate **2**,

**1001** and **1002** are slots with different widths **41**, **42** and **43** formed on lock plate **2**,

**41**, **42** and **43** are sections of elongated slots **1001** and **1002** with different widths;

**21**, **22** and **23** are hooks bent from the front end of plate tongues **1010**, **1011**, and **1012** on lock plate **2**, where hook **21** and **23** have the same bending direction, while hook **22** has the reverse direction;

**211**, **221** and **231** are the transition bevels between hooks **21**, **22**, and **23** and plate tongues **1010**, **1011**, and **1012**;

**55** is the hole formed on lock plate **2**;

**551** is the flange of hole **55** on lock plate **2**;

**16** is the rectangular hole on the side surfaces of lock shell **1**;

**17** is the flange strip on the internal surface on the bottom of lock shell **1**;

**111, 121** and **131** are the inclined bearing surfaces supporting blocks of hook transition bevels **211, 221** and **231**;

**15** is the opening with an arc **151** formed on the upper surface of lock shell **1**, where eccentric lock cam **3** is inserted;

**53** is a small hole on the lower side surface of lock shell **1** that matches the small shaft **331** of eccentric lock cam,

**146** is the rectangular hole formed on the internal surface of lower side of lock shell **1**;

**26** is a U-shaped half loop on the back end of lock plate **2** having an end surface in the form of a plane;

**24** is the elastic brace rod on lock plate **2**,

**241** is the contact point between elastic brace rod and **141** on internal surface of lower side of lock shell **1**,

**27** is the stop tooth on lock plate **2** that, together with eccentric cam **332** constitute the stop structure,

**28** is the barrier tooth on lock plate **2**,

**331** is the small shaft of eccentric lock cam **3**, which is inserted into the small hole **53** on the lower side surface of lock shell **1** through hole **55** formed on lock plate **2**;

**332** is a fully arc shaped eccentric cam located on hole **55** of lock plate **332** that, together with stop tooth **27** constitute the stop structure;

**333** is the big shaft at the head of eccentric lock cam **3**, matching with the side arc **151** on lock shell **1**,

**334** is a Quincunx lock hole **334**, which is easy for lock and open, formed on the surface of big shaft **333** at the head of eccentric lock cam **3**.

## DETAILED DESCRIPTION

[0028] As shown in Figures 4-11, A connecting lock for exhibition stands comprises a lock shell 1, a lock plate 2 and an eccentric lock cam 3.

[0029] Lock shell 1 is designed to receive lock plate 2. Lock shell 1 has inclined bearing surfaces 131, 121 and 111 in a front portion 1104 thereon. Lock shell 1 also forms two holes 15 and 53 that are configured to receive eccentric lock cam 3. Opening 15 has an arc 151. A first rectangular hole 146 is formed on the upper surface of lock shell 1, and a second rectangular hole 16 is formed on the upper side of lock shell 1. A flange strip 17 is disposed on the internal surface of the bottom side of lock shell 1 (See Figures 4 and 5).

[0030] Lock plate 2 has a front end 1100 and a back end 1102, with a plurality of plate tongues 1010, 1011, and 1012 having different widths being disposed at the front end 1100 of lock plate 2. The front end of each plate tongue 1010, 1011, and 1012 are bent into hooks 21, 22, and 23, respectively, with a reverse bending direction between adjacent hooks. Each plate tongue has a beveled surface 231, 211, and 221. The plate tongues are separated by elongated slots 1001 and 1002, with each slot being divided into three sections 41, 42, and 43 of different widths. The back end 1102 of lock plate 2 is bent into a U-shaped half-loop 26 having an end surface 261 in the form of a plane. A stop tooth 27 is also disposed on lock plate 2.

[0031] Eccentric lock cam 3 comprises a fully arc shaped eccentric cam 332, a big shaft 333, and a small shaft 331. A Quincunx hole 334, which allows easy rotation of eccentric lock cam 3 with a special matching tool, is formed on the surface of big shaft 333. (See Figures 9-11)

**[0032]** Stop tooth 27 on lock plate 2 and arc shaped eccentric cam 332 on eccentric lock cam 3 combine to constitute a stop structure for the connecting lock.

**[0033]** During use, lock plate 2 is inserted into lock shell 1. After lock plate 2 has been inserted into lock shell 1, eccentric lock cam 3 is first inserted through the bottom of lock shell 1 into opening 15 on lock shell 1. After passing through opening 15, eccentric lock cam 3 is inserted through hole 55 on lock plate 2 and into hole 53 of lock shell 1.

**[0034]** After eccentric lock cam 3 has been fully inserted through opening 15 and holes 55 and 53, eccentric lock 3 is rotated counterclockwise with a special tool until eccentric lock cam 3 reaches stop tooth 27, which prevents eccentric lock cam 3 from rotating anymore (see Figures 4, 5, 6, 7, 8, 9, 10 and 11). Whereas lock plate 2 relies on an acting force generated by eccentric lock cam 3 to realize back and forth movement, the setting of a working point is better for eccentric lock cam 3 to be able to apply the acting force on lock plate 2. In one embodiment, the working point is formed by bending the back end 1102 of lock plate 2 into a U-shaped half-loop 26 having an end surface 261 which is a plane. When lock plate 2 is inserted into lock shell 1, eccentric cam 332 pushes against the end surface 261 of half-loop 26 at the back end 1102 of lock plate 2. This moves lock plate 2 backwards, causing bevels 231, 211 and 221 on plate tongues 1010, 1011, and 1012 to move backwards along inclined bearing surfaces 131, 121 and 111 in the front end of lock shell 1. This causes hooks 21, 22 and 23 on the front end of lock plate 2 to expand along reverse directions, causing the connecting lock fixed in the beam to be locked inside the column section bar, forming steady and fixed frame exhibition stands.

**[0035]** Other technical measures can also be used to realize the back and forth movement. For example, in one embodiment, a wedged bulge 262 is disposed on the back end 1102 of lock plate 2 such that bulge 262 is disposed behind eccentric lock cam 3 when eccentric lock cam 3 is inserted into the connecting lock. This can constitute a “V” shape through connecting with lock plate 2. The fabrication of wedged bulge 262 can be completed during the manufacturing process of lock plate 2 together with the punch of lock plate 2. Compared with the process of bending edge folds to get the working point of the acting force, this is a much simpler process. The manufacturing process of wedged bulge 262 may be realized along with the punch process of lock plate 2 manufacturing, so it has the advantages of lower manufacturing costs due to the simple process. The “V” shaped connection between wedged bulge 262 and lock plate 2 applied in this technical measure will also increase the connecting strength between wedged bulge 262 and lock plate 2, enabling wedged bulge 262 to have a better bearing capability. Also, because this technical measure can make the contact surface between eccentric lock cam 3 and lock plate 2 to be vertical with the direction of the acting force that pushes lock plate 2, the reliability of this invention is enhanced.

**[0036]** A barrier tooth 28 can also be disposed on lock plate 2 to restrict eccentric cam 332 from rotating clockwise. Hole 55 on Lock plate 2 also has a flange 551 (see Figures 7 and 8).

### **Abstract**

A connecting lock for exhibition stands has a lock shell (1), a lock plate (2) and an eccentric lock wheel (3). The lock plate (2) includes a plurality of plate tongues (1010, 1011, 1012) at a front end thereof, the plate tongues being separated by two long grooves (1001, 1002) with different widths. The front end of each plate tongue is respectively made into a hook (21, 22, 23), each hook being curved in an opposite direction from adjacent hooks. The rear end of the lock plate is curved into a U-shaped half loop (26) having an end surface (261) in the form of a plane. The support structure consists of three respective oblique planes (231, 211, 221) of the three plate tongues (1010, 1011, 1012) and relative oblique bearing surfaces (131, 131, 111) in the front of the lock shell (1). A stop structure consists of a stop tooth (27) of the lock plate (2) and an eccentric cam (332) of the eccentric lock wheel (3).

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